

## Trend Study 18A-26-07

Study site name: Salt Mountain.

Vegetation type: Stansbury Cliffrose.

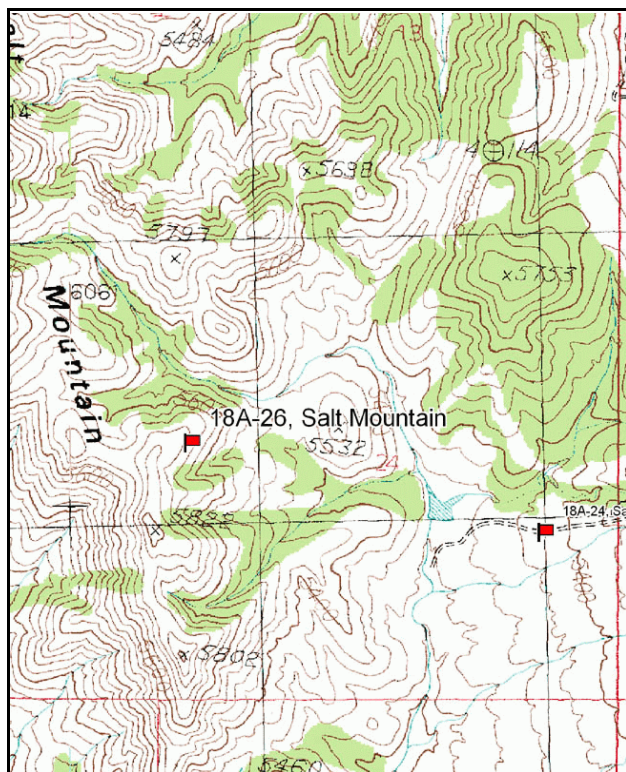
Compass bearing: frequency baseline 0 degrees magnetic (Line 1 @ 360°M, line 2 @ 343°M and line 3 @ 205°M).

Frequency belt placement: line 1 (11 & 95), line 2 (59ft), line 3 (71ft), line 4 (34ft).

Rebar: Line 3 belt 4: rebar on 3 feet.

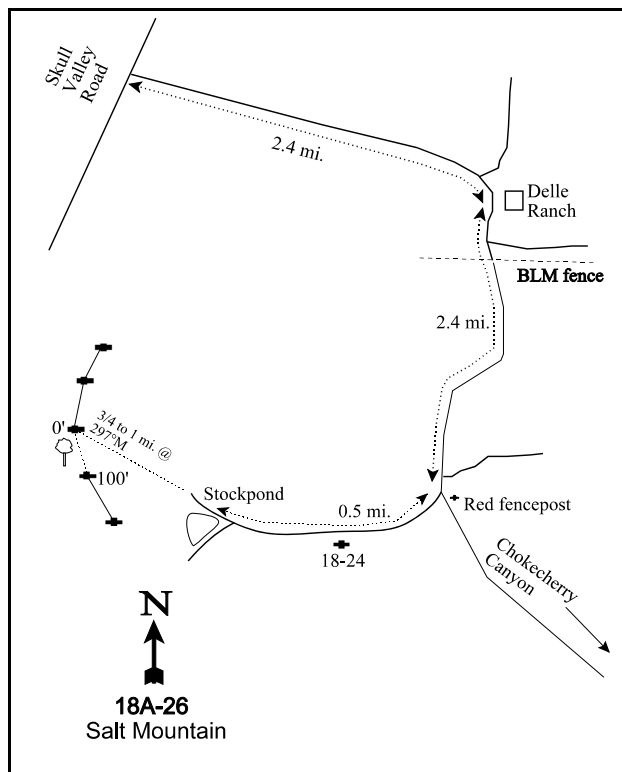
### LOCATION DESCRIPTION

Turn east off Skull Valley Road between mile mark 24 and 25. From the Skull Valley Road, go 2.4 miles staying right on the main road to Delle Ranch ponds and trees. The road then turns south. From Delle Ranch, proceed south for 2.4 miles to an intersection to the right (west) heading to Salt Mountain. There will be a red post on the east side of this intersection. Turn right (west) and continue for 0.5 miles to a stock pond, passing study 18A-24. From the right fork or road to the north of the stock ponds, walk at 297 degrees magnetic for 0.75 to 1.0 miles to the study area. An old, marked browse study runs along the ridge at the top of this slope, while the trend study is located among the sparse junipers and cliffrose below the ridge. The baseline runs north across the slope. The 0-foot stake is marked with browse tag #169.



Map Name: Salt Mountain

Township 3S, Range 8W, Section 24



Diagrammatic Sketch

GPS: NAD 83, UTM 12T 355675 E 4489457 N

## DISCUSSION

### Salt Mountain - Trend Study No. 18A-26

#### Study Information

This study, located on the east side of Salt Mountain, samples critical deer winter range within the Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) range type [elevation: 5,600 feet (1,707 m), slope: 55%, aspect: southeast]. There is also a browse transect located within the immediate vicinity of the study. Utilization of cliffrose and sagebrush was moderate-heavy in 1983 with large numbers of pellet groups present. Pellet group data from 2002 estimated 56 deer days use/acre (139 ddu/ha). In 2007, use decreased to 38 deer days use/acre (94 ddu/ha) and 3 elk days use/acre (8 edu/ha). All pellet groups appeared to be from winter use. A deer mandible was also noted on the site in 2007.

#### Soil

The soil is classified within the Amtoft series (USDA-NRCS 2007). Soils in this series were formed in material weathered from calcareous sedimentary rock. They are moderately shallow and well-drained. The soil has a sandy clay loam texture and a moderately alkaline soil reaction (pH 7.4). The surface is covered with dark-colored rock. The relative vegetative cover was 27% in 2002 and 34% in 2007. Combined relative vegetation and litter cover increased from 55% in 2002 to 60% in 2007. Erosion is not a significant problem, despite the steep slope. The erosion condition class was determined as stable in 2002 and 2007.

#### Browse

The browse composition consists of a sparse stand of Stansbury cliffrose and Wyoming big sagebrush, with occasional individuals of gray horsebrush (*Tetradymia canescens*), Utah juniper (*Juniperus osteosperma*), and broom snakeweed (*Gutierrezia sarothrae*). Cliffrose plants vary in height from about 6 inches (15 cm) to individuals well above the reach of deer. However, the average cliffrose crown height has been slightly over 4 feet (1.2 m), and most of the foliage is available to wildlife. Cliffrose density was 600 plants/acre (1,483 plants/ha) in 1983, 133 plants/acre (329 plants/ha) in 1989 and approximately 100 plants/acre (247 plants/ha) in 2002 and 2007. This trend study is an example of the mid-1980s shrub die-off that affected different locations within the Great Basin. While age structure in 1983 was 78% mature plants, the entire cliffrose population was classified as decadent in 1989. No decadent individuals were sampled in 2002 and only 20% of the population was decadent in 2007. The density of dead plants decreased from 220 plants/acre (544 plants/ha) in 2002 to 60 plants/acre (148 plants/ha) in 2007. Vigor has remained good since 1983. Use was moderate-heavy in 1983, and in 1989, all of the cliffrose plants were moderately or heavily hedged. Utilization was mostly light in 2002, and 80% of the plants displayed moderate-heavy hedging in 2007. Annual leader growth averaged 4.3 inches (10.9 cm) in 2002 and 1.9 inches (4.9 cm) in 2007.

Sagebrush had a low density of approximately 200 plants/acre (494 plants/ha) in 1983 and 1989, 960 plants/acre (2,372 plants/ha) in 2002, and 1,000 plants/acre (2,471 plants/ha) in 2007. The increase in the estimated density appears to be reflective of the increased sample area used in 1997. In 1983 and 1989, 33% of the sagebrush population was classified as decadent, but decadence had declined to 4% by 2007. The majority of the plants have been mature every sample year. The density of dead plants increased from 180 plants/acre (448 plants/ha) in 2002 to 340 plants/acre (840 plants/ha) in 2007. Plants with poor vigor made up 33% of the population in 1983, but vigor has been good since. Use was heavy in 1983, light in 1989, and light-moderate in 2002 and 2007. Annual leader growth averaged 1.9 inches (4.8 cm) in 2002 and 1.7 inches (4.4 cm) in 2007. In 2007, the sagebrush defoliator moth (*Aroga websteri*) had infested 36% of the plants.

Utah juniper density has remained stable at approximately 40 trees/acre (99 trees/ha) since 2002, but individuals have grown larger. The average trunk diameter of juniper in 2002 was 8.5 inches (21.6 cm) and 12.1 inches (30.6 cm) in 2007.

### Herbaceous Understory

Grasses comprise the majority of herbaceous cover. Cheatgrass (*Bromus tectorum*), although not reported in 1983 and 1989 because annuals were not recorded, was abundant and produced more cover than perennial grasses in 2002 and 2007. This species provided 9% cover in 2002 and 18% in 2007, with quadrat frequencies of 96% and 100%, respectively. Perennial grasses include bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*). These species occur as scattered bunches within the uniform cover of cheatgrass. Grasses showed no evidence of use in 2002 and 2007. Forbs are sparse. The few perennial or biennial species that occur are rare and have little value for forage or erosion protection. Storksbill (*Erodium cicutarium*) has provided the majority of forb cover since 2002. It provided 1% of the total ground cover in 2002 and nearly 2% in 2007.

### 1989 TREND ASSESSMENT

The trend for browse is down. Cliffrose density decreased to 133 plants/acre (329 plants/ha), and all plants were classified as decadent. Utilization on the available cliffrose branches was moderate-heavy. The plants that were not available to wildlife were noted as having good seed production, but no seedling or young plants were sampled. The sagebrush population remained at a stable density of 199 plants/acre (492 plants/ha). The majority (67%) of the plants were classified as mature, while 33% of the population was classified as decadent. Some severely hedged plants were observed outside of the density strips that had a clubbed form, low growth, and no seed production. Smaller sagebrush, such as the few mature shrubs sampled within the density plots, displayed excellent growth and vigor. The trend for grass is up. Observations indicated less cheatgrass due to dry conditions. The sum of nested frequency for perennial grasses increased 63%. The nested frequencies of both bluebunch wheatgrass and Sandberg bluegrass increased significantly. The trend for forbs is stable. Four species of perennial forbs were sampled in 1989 that were not present in 1983, but none of the three species sampled in 1983 were sampled again in 1989. Forbs were rare and provided little forage.

browse - down (-2)

grass - up (+2)

forb - stable (0)

### 2002 TREND ASSESSMENT

The trend for browse is up. Preferred browse species provided approximately 7% canopy cover. Cliffrose density remained relatively stable at 120 plants/acre (297 plant/ha). However, the age distribution within the population improved from 100% decadent in 1989 to 33% young and 67% mature. These plants were vigorous, with many plants flowering and producing seeds. Use was mostly light. Sagebrush increased in density from 200 plants/acre (494 plants/ha) to 960 plants/acre (2,372 plants ha), although this increase may partially reflect the larger sampling area adopted since the previous sampling. The population was largely mature, with only 10% young and 8% decadent plants. Use was mostly light, and vigor was good. The trend for grass is stable. The sum of nested frequency for perennial grasses decreased 9%. Cheatgrass was still abundant, occurring in nearly every quadrat. It produced 42% of the grass cover and 9% of the total ground cover. Bluebunch wheatgrass decreased significantly in nested frequency. The trend for forbs is stable. These species continued to account for a very small percentage of the total vegetative cover, and the sum of nested frequency for perennial forbs changed little. The Desirable Components Index (DCI) was rated as poor, due to very low browse cover, the abundance of cheatgrass, and the lack of forbs.

winter range condition (DCI) - poor (22) Low potential scale

browse - up (+2)

grass - stable (0)

forb - stable (0)

### 2007 TREND ASSESSMENT

The trend for browse is stable. Cliffrose density remained relatively unchanged. Decadence increased from 0% of the population to 20%, however, young plants decreased to 20%, which is still considered sufficient to maintain the population. The majority of the population showed moderate-heavy use, but the plants were vigorous. The sagebrush density remained stable at 1,000 plants/acre (2,471 plants/ha). Young recruitment remained stable at 14% of the population, and decadence remained low at 4% of the population. Sagebrush

utilization was light-moderate, and only 4% of the population showed poor vigor. There were worm infestations on some cliffrose plants and a rust infestation on gray horsebrush. The sagebrush defoliator moth (*Aroga websteri*) had infested 36% of the population. The trend for grass is down. The sum of nested frequency for perennial grasses decreased 20%, and the nested frequency of cheatgrass increased significantly. This species comprised 61% of the total grass cover and 47% of the total vegetative cover. Sandberg bluegrass decreased significantly in nested frequency. The trend for forbs is stable. There was an increase in the number of forb species that were sampled in 2007. Several species that were present in 2002 increased significantly in nested frequency, however, all were annuals. One of these species was bur buttercup (*Ranunculus testiculatus*), which is allelopathic (Buchanan et al. 1978). Storksbill, which was shown by Kimball and Schiffman (2003) to outcompete and prevent the establishment of native rangeland species, also increased significantly in nested frequency. Although the total nested frequency for forbs increased since 2002, these species were very sparse and undesirable annuals. The DCI was rated as fair, due to a slight increase in preferred browse cover.

winter range condition (DCI) - fair (37) Low potential scale

browse - stable (0)

grass - down (-2)

forb - stable (0)

#### HERBACEOUS TRENDS --

Management unit 18A, Study no: 26

T y p e	Species	Nested Frequency				Average Cover %	
		'83	'89	'02	'07	'02	'07
G	Agropyron spicatum	<sub>a</sub> 183	<sub>b</sub> 222	<sub>a</sub> 160	<sub>a</sub> 135	6.60	7.88
G	Bromus tectorum (a)	-	-	<sub>a</sub> 306	<sub>b</sub> 366	8.57	18.28
G	Oryzopsis hymenoides	1	-	-	-	-	-
G	Poa secunda	<sub>a</sub> 73	<sub>bc</sub> 198	<sub>c</sub> 224	<sub>b</sub> 174	5.32	3.74
Total for Annual Grasses		0	0	306	366	8.57	18.28
Total for Perennial Grasses		257	420	384	309	11.93	11.62
Total for Grasses		257	420	690	675	20.51	29.91
F	Agoseris glauca	-	<sub>a</sub> 4	-	<sub>a</sub> 1	-	.00
F	Allium sp.	-	<sub>a</sub> 4	<sub>a</sub> 3	-	.02	-
F	Calochortus nuttallii	<sub>a</sub> 1	-	-	<sub>a</sub> 3	-	.00
F	Cirsium neomexicanum	<sub>b</sub> 4	-	-	<sub>a</sub> -	-	.00
F	Delphinium nuttallianum	-	1	-	-	-	-
F	Descurainia pinnata (a)	-	-	-	9	-	.04
F	Draba sp. (a)	-	-	-	67	-	.15
F	Erodium cicutarium (a)	-	-	<sub>a</sub> 67	<sub>b</sub> 114	1.22	1.61
F	Gilia sp. (a)	-	-	1	-	.00	-
F	Holosteum umbellatum (a)	-	-	-	17	-	.03
F	Lappula occidentalis (a)	-	-	<sub>a</sub> 4	<sub>b</sub> 24	.01	.07
F	Lactuca serriola	-	<sub>a</sub> 8	<sub>a</sub> 2	<sub>a</sub> 3	.01	.00

T y p e	Species	Nested Frequency				Average Cover %	
		'83	'89	'02	'07	'02	'07
F	Ranunculus testiculatus (a)	-	-	<sub>a</sub> 10	<sub>b</sub> 68	.02	.21
F	Senecio sp.	2	-	-	-	-	-
Total for Annual Forbs		0	0	82	299	1.25	2.13
Total for Perennial Forbs		7	17	5	7	0.02	0.01
Total for Forbs		7	17	87	306	1.28	2.15

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 18A, Study no: 26

T y p e	Species	Strip Frequency		Average Cover %	
		'02	'07	'02	'07
B	Artemisia tridentata wyomingensis	28	30	3.55	4.06
B	Cowania mexicana stansburiana	6	5	.21	1.21
B	Gutierrezia sarothrae	1	1	-	-
B	Juniperus osteosperma	2	2	2.23	1.42
B	Opuntia sp.	4	4	.15	.03
B	Tetradymia canescens	0	1	.18	.03
Total for Browse		41	43	6.32	6.76

#### CANOPY COVER, LINE INTERCEPT --

Management unit 18A, Study no: 26

Species	Percent Cover	
	'02	'07
Artemisia tridentata wyomingensis	4.38	5.01
Cowania mexicana stansburiana	2.41	2.83
Gutierrezia sarothrae	.08	.01
Juniperus osteosperma	2.59	3.03
Opuntia sp.	-	.15
Tetradymia canescens	.03	-

# KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 18A, Study no: 26

Species	Average leader growth (in)	
	'02	'07
<i>Artemisia tridentata wyomingensis</i>	1.9	1.7
<i>Cowania mexicana stansburiana</i>	4.3	1.9

# POINT-QUARTER TREE DATA --

Management unit 18A, Study no: 26

Species	Trees per Acre		Average diameter (in)	
	'02	'07	'02	'07
<i>Juniperus osteosperma</i>	42	40	8.5	12.1

# BASIC COVER --

Management unit 18A, Study no: 26

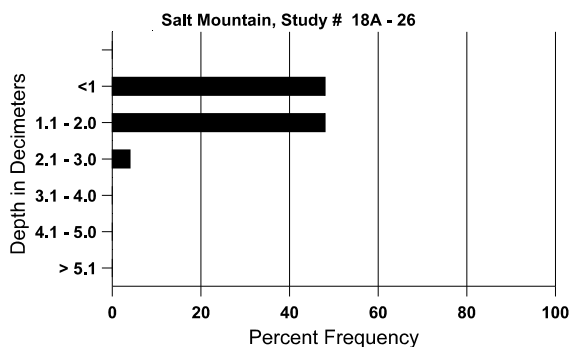
Cover Type	Average Cover %			
	'83	'89	'02	'07
Vegetation	.50	10.75	29.36	38.68
Rock	19.00	8.50	16.42	17.04
Pavement	15.50	33.25	7.93	9.13
Litter	41.75	34.50	30.76	29.57
Cryptogams	5.00	.50	5.21	7.20
Bare Ground	18.25	12.50	18.84	12.68

# SOIL ANALYSIS DATA --

Herd Unit 18A, Study no: 26, Salt Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	Sandy clay loam			%OM	ppm P	ppm K	dS/m
			% sand	% silt	% clay				
8.6	73.8 (9.6)	7.4	47.3	20.7	32.0	1.7	6.0	156.8	.7

# Stoniness Index



PELLET GROUP DATA --

Management unit 18A, Study no: 26

Type	Quadrat Frequency		Days use per acre (ha)	
	'02	'07	'02	'07
Rabbit	19	52	-	-
Elk	-	2	-	3 (8)
Deer	17	18	56 (139)	38 (94)
Cattle	-	1	-	-

BROWSE CHARACTERISTICS --

Management unit 18A, Study no: 26

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
83	<b>199</b>	-	-	133	66	-	0	100	33	-	33	12/17
89	<b>199</b>	-	-	133	66	-	0	0	33	-	0	15/16
02	<b>960</b>	20	100	780	80	180	33	0	8	-	0	22/31
07	<b>1000</b>	100	140	820	40	340	26	2	4	4	4	27/42
<i>Cowania mexicana stansburiana</i>												
83	<b>599</b>	-	100	466	33	-	50	33	6	-	11	56/47
89	<b>133</b>	-	-	-	133	-	75	25	100	-	0	-/-
02	<b>120</b>	-	40	80	-	220	17	17	0	-	0	50/57
07	<b>100</b>	-	20	60	20	60	40	40	20	-	0	48/48
<i>Ephedra nevadensis</i>												
83	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
89	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
02	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
07	<b>0</b>	-	-	-	-	-	0	0	-	-	0	38/50
<i>Gutierrezia sarothrae</i>												
83	<b>1399</b>	-	666	733	-	-	0	0	-	-	2	14/16
89	<b>100</b>	-	-	100	-	-	0	0	-	-	0	8/12
02	<b>60</b>	-	-	60	-	20	0	0	-	-	0	13/19
07	<b>100</b>	40	-	100	-	-	0	0	-	-	0	6/8
<i>Juniperus osteosperma</i>												
83	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
89	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
02	<b>40</b>	-	-	40	-	20	0	0	-	-	0	-/-
07	<b>40</b>	-	-	40	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<b>Opuntia sp.</b>												
83	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
89	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
02	<b>80</b>	-	-	80	-	-	0	0	-	-	0	4/11
07	<b>80</b>	-	-	80	-	-	0	0	-	-	0	6/7
<b>Tetradymia canescens</b>												
83	<b>100</b>	-	-	100	-	-	0	0	0	-	0	22/30
89	<b>99</b>	-	-	33	66	-	0	0	67	-	33	22/23
02	<b>0</b>	-	-	-	-	20	0	0	0	-	0	26/51
07	<b>20</b>	-	-	-	20	20	0	0	100	-	100	27/48